New York State Integrated Pest Management Program | Cornell Cooperative Extension

Lauryl Sulfate Profile

Active Ingredient Eligible for Minimum Risk Pesticide Use

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Label Display Name: Lauryl sulfate

Active Components: Lauryl sulfate

CAS Registry #: 151-41-7

U.S. EPA PC Code: Not found

CA DPR Chem Code: 5771

Other Names: Dodecyl sulfate; lauryl sulfuric acid; dodecyl hydrogen sulfate; monododecyl hydrogen sulfate; sulfuric acid, monododecyl ester; Monododecyl sulfate, 9CI; Dodecylhydrogensulfat (German)

Other Codes: BRN: 1710530; Gmelin: 220505; SMILES: CCCCCCCCCCCCOS(O)(=O)=O

Summary: Lauryl sulfate, otherwise known as hydrogen dodecyl sulfate, is an anionic surfactant. It is not commonly used in pesticides, with sodium lauryl sulfate being the preferred form. Lauryl sulfate has selective antimicrobial activity and is also synergistic with various insecticides. Given current limited uses, there is little evidence that lauryl sulfate poses significant risks to human health or the environment.

Pesticidal Uses: Antimicrobial; adjuvant in mosquito repellent.

Formulations and Combinations: Used as an anionic surfactant with various essential oils and other active ingredients. Not as commonly used as its sodium salt, sodium lauryl sulfate. No formulations were found that have lauryl sulfate as the sole active ingredient.

Basic Manufacturers: Angene; Zhejiang Junhao Chemical (China); Ulrich (Switzerland); Calstar (US).

Safety Overview: Lauryl sulfate was not explicitly mentioned in considering the registration of the lauryl sulfate salts (US EPA 1993). However, various lauryl sulfate salts were re-reviewed by US EPA in 2010, in which it states “currently registered uses of lauryl sulfate salts will have ‘no effect’ on any federally listed, threatened or endangered species”. The review goes on to say that the current registered uses of lauryl sulfate salts will not “destroy or adversely modify any designated critical habitat of such species” (Harrigan-Farrelly 2010). Little other information specific to the safety of lauryl sulfate is available.

Background

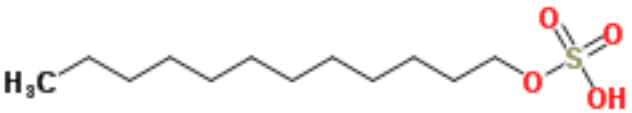
Lauryl sulfate is an alkyl sulfate that is a conjugate acid of dodecyl sulfate and a conjugate base of dodecyl hydrogen sulfate (EMBL 2015). It is used with azo reagents in a 1% aqueous solution in photometric detections and analysis of metals (ChemNetBase 2015).

Chemical and Physical Properties

The molecular structure of lauryl sulfate is in Figure 1:

Figure 1

Lauryl Sulfate molecular structure



Source: (Royal Society of Chemistry 2015)

The physical and chemical properties of lauryl sulfate appear in Table 1.

Table 1

Physical and Chemical Properties of Lauryl Sulfate

Property	Characteristic/Value	Source
Molecular Formula:	$C_{12}H_{26}O_4S$	(EMBL 2015)
Molecular Weight:	266.40	(EMBL 2015)
Percent Composition:	C: 54.1%; H: 9.84%; O: 24.02%; S: 12.04%	(Royal Society of Chemistry 2014)
Physical state at 25°C/1 Atm.	Solid	(Johnson 2013)
Color	Not found	
Odor	Not found	
Density/Specific Gravity	1.059 g/cm^3	(Angene 2010)
Melting point	205.5°C	(Royal Society of Chemistry 2015)
Boiling point	387.8°C	(EPI 2012)
Solubility	1 g in 10 ml water	(Royal Society of Chemistry 2015)
Vapor pressure	3.15 x 10^{-8} mm Hg at 25°C	(EPI 2012)
pH	Not found	
Octonol/Water (K_{ow}) coefficient	2.42	(EPI 2012)
Viscosity	N/A	
Miscibility	N/A	
Flammability	Not found	
Storage stability	Not found	
Corrosion characteristics	Not found	
Air half life	17.1 hr	(EPI 2012)
Soil half life	720 hrs	(EPI 2012)
Water half life	360 hrs	(EPI 2012)
Plant surface half life	582 hrs	(EPI 2012)

When heated to decomposition, it releases toxic sulfur oxides (US NLM 2015). Lauryl sulfate was compared with sodium lauryl sulfate in carrying out catalytic reactions on complex chemical structures. Both increased the rate of reaction, an effect that was decreased in the presence of various alcohols. Lauryl sulfate consistently had a lower degree of dissociation than sodium lauryl sulfate (Bravo et al. 1992).

Human Health Information

Acute Toxicity

Acute toxicity values specific to lauryl sulfate were not found.

Sub-chronic Toxicity

Sub-chronic toxicity values specific to lauryl sulfate were not found.

Chronic Toxicity

Chronic toxicity results specific to lauryl sulfate were not found.

Human Health Incidents

The National Pesticide Information Center (NPIC) received two reported human health incidents involving lauryl sulfate between April 1, 1996 and March 30, 2016 (NPIC 2016). Both involved other active ingredients in addition to lauryl sulfate. None were in New York State.

Environmental Effects Information

Effects on Non-target Organisms

No studies on the effects of lauryl sulfate on non-target organisms were found. NPIC received one report of an animal incident involving lauryl sulfate between April 1, 1996 and March 30, 2016 (NPIC 2016). Details of the incident were not available.

Environmental Fate, Ecological Exposure, and Environmental Expression

Lauryl sulfate is classified as readily biodegradable (US NLM 2015).

Environmental Incidents

No other studies of the environmental impacts specific to lauryl sulfate were found. NPIC data had no other incidents involving lauryl sulfate reported during the 20-year period following implementation of §25b.

Efficacy

Antimicrobial Activity

Lauryl sulfate was effective in inhibiting the growth of a broad range of gram-positive bacteria, including *Actinomyces* spp. and *Bacillus subtilis*, but had only limited efficacy in the control of gram-negative bacteria, including *Aerobacter aerogenes* and *E. coli* (Waksman and Woodruff 1942).

Insecticidal Activity

Lauryl sulfate is more properly classified as a synergist rather than an insecticide by itself (Goodhue and Sullivan 1944). No efficacy data was found for the insecticidal properties of lauryl sulfate by itself. All formulations found containing lauryl sulfate had other active ingredients. Most are mosquito repellents that contain essential oils (e.g see CVS 2015).

Standards & Regulations

EPA Requirements

Lauryl sulfate (CAS 151-41-7) does not appear on the exemption from tolerances at 40 CFR 180.

FDA Requirements

Lauryl sulfate is not listed as Generally Recognized As Safe (GRAS) by the FDA in either 21 CFR 182 or 21 CFR 184.

Other Regulatory Requirements

Synthetic lauryl sulfate does not appear on the National List of allowed synthetic substances allowed for organic crop production [7 CFR 205.601] and is therefore prohibited [7 CFR 205.105(a)].

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